

Note –First 15 minutes are allotted for the candidates to read the question paper.

Instructions:

1- All Questions are compulsory.

2- This Questions paper have 5 sections : A, B,C,D,E.

3- Section: A is multiple choice type and each question carries one mark.

4- Section: B is very short answer type and each question carries one mark.

5- Section: C is a short answer type I and carries two marks each.

6- Section: D is of short answer type II and carries three marks each.

7- Section: E is of long answer type and carries five marks. All four questions of this sections have been given internal choice. You have to do only one question from the choice given in the question.

Section A

- 1(a) Which of the following electromagnetic radiation has minimum wave length? 1
- | | |
|---------------------|----------------|
| i. Ultraviolet rays | ii. X-rays |
| iii. Microwaves | iv. Gamma rays |
- (b) The momentum of a moving particle is p . The wavelength of the matter wave will be- 1
- | | |
|------------|-----------|
| i. h/p | ii. p/h |
| iii. $p.h$ | iv. p |
- (c) Kirchoff's First law is based on conservation of- 1
- | | |
|-------------|--------------|
| i. Energy | ii. Momentum |
| iii. Charge | iv. Mass |
- (d) The reverse saturation current in p-n Junction Diode is due to only- 1
- | | |
|-----------------------------|------------------------------|
| i. Minority Charge carriers | ii. Majority charge carriers |
| iii. Acceptor ion | iv. Donor ion |
- (e) The majority charge carriers in p -type and n-type semi-conductor are-----and ----- respectively. 1
- | | |
|----------------------|--------------------------------|
| i. Electron-electron | ii. Electron Hole |
| iii. Hole -electron | iv. Electron and Positive ions |
- (f) The wire of Meter Bridge is made up of- 1
- | | |
|-------------------------|------------|
| i. Iron | ii. Copper |
| iii. Manganin or Eureka | iv. steel |

Section B

- 2 (a) What is the minimum wavelength of Balmer series? 1
- (b) Write the formula for Refraction of light at a single spherical surface? 1

- (c) Explain the meaning of Isotope with the help of an example? 1
- (d) Write Radioactive waves in increasing order of their penetrating power? 1
- (e) How can the capacitance of a capacitor be increased? 1
- (f) Give Logic symbol, Boolean Expression and Truth Table for AND gate? 1

Section C

- 3 (a) Write the definition and unit of electric flux. What is the meaning of negative electric flux? 2
- (b) 5 Ampere current is flowing in a wire. How many electrons pass per minute through cross section area of the wire? 2
- (c) In the Hydrogen spectrum, find the wavelength of the second line of Balmer series in terms of Rydberg constant(R). 2
- (d) Find the expression for de-Broglie wavelength. 2

Section D

- 4(a) Derive the formula for the resultant focal length of two thin lenses placed in contact of each other. 3
- (b) Derive Einstein's photoelectric equation. 3
- (c) Prove by Brewster's Law that refracted and reflected rays are mutually perpendicular to each other. 3
- (d) Write Ampere circuital law. Derive the formula for magnetic field intensity at the distance 'r' from the current carrying straight wire of infinite length. 3
- (e) The coefficient of self Induction of a coil is 40 milli Henry(40MH) in which electric current becomes 2 ampere to 12 ampere in 5 milli second. Find the value of induced electromotive force in coil. 3
- 5(a) The focal length of a thin plano convex lens is 20.0 cm and the refractive index of its material is 1.5. Find radius of curvature of convex surface of this lens. 3
- (b) A small telescope has an objective of focal length 144 cm and an eyepiece of focal length 6.0 cm. Calculate the magnifying power of the telescope. What is the distance between the objective and the eyepiece in the telescope. 3
- (c) What is LED. Show its (vi) characteristics by drawing a circuit diagram. 3
- (d) Explain Kirchoff's laws of electric circuits with the help of circuit diagram. 3

Or

The oscillating magnetic field in a plane electromagnetic wave is given by 3

$$B_y = (8 \times 10^{-6}) \sin(2 \times 10^{11} t + 300 \pi x) \text{ Tesla.}$$

- i) Calculate the wavelength of electromagnetic wave.
- ii) Write down the expression for the oscillating electric field.
- (e) The energy of an electron in an excited hydrogen atom is -3.4eV. Calculate the angular momentum of the electron. The energy of electron in n^{th} orbit is $-\frac{13.6}{n^2}$ eV. ($h=6.6 \times 10^{-34}$ Joule Second) 3

Section E

6- Define capacitance of a capacitor. Derive the expression for the capacitance of parallel plate capacitor. How can its capacitance be increased. 5

Or

What is linear charge density? Applying Gauss's theorem, find the expression for the electric field intensity near a uniformly charged straight wire of infinite length. 5

7- An electron is moving in a circular path of radius 2×10^{-10} m with a uniform speed of 3×10^6 m/s. Calculate the magnetic field at the centre of the circular path. 5

(Given:- $\frac{\mu_0}{4\pi} = 10^{-7} \frac{\text{weber per ampere meter}}{\text{Ampere}}$ \times meter, $e = 1.6 \times 10^{-19}$ coulomb)

Or

Derive the formula for force between two parallel current carrying conductors. 5

8) Draw a series resonance circuit for L-C-R combination. Derive the formula of resonant frequency for this circuit. How does resonant frequency depend on resistance? 5

Or

In Young's experiment while using a source of light of wavelength 4000 \AA , the fringe width of 0.6 mm is obtained at a distance of 2m on the screen. If the entire apparatus is immersed in a liquid of refractive index 1.5, find the value of fringe width. 5

9) Explain the process of electric conduction in n-p-n transistor. Why its base is made thin? Why is it more useful in comparison to p-n-p transistor. 5

Or

Discuss Huygens's principle of secondary wavelets. 5
